CLAIMS

1. A method for maintaining the enclosed volume of a sealed package at about ambient pressure, wherein the package contains pressurized MDI (metered dose inhaler) container comprising a drug, and an HFA (hydrofluoroalkane) propellant selected from the group consisting of HFA 134a and HFA p227, or a mixture thereof; wherein the method comprises the steps of:
   (i) positioning an effective amount of a HFA adsorbent material, and said pressurized container, within a sealable package;
   (ii) sealing the package so that the pressurized container and adsorbent are in an enclosed volume within the package at a pressure equal to about ambient pressure; and
   (iii) adsorbing any leakage of the HFA propellant into the HFA adsorbent material so as to maintain the enclosed volume at about ambient pressure.
2. The method according to claim 1, wherein the drug is selected from the group consisting of bronchodilators, antihistamines, lung surfactants, antiviral agents, corticosteroids, ant-inflammatory agents, anti-cholinergics, and antibiotic.
3. The method according to claim 1, wherein the pressurized MDI (metered dose inhaler) container further comprises one or more excipients selected from the group consisting of surfactants, preservatives, flavorings, antioxidants, anti-aggregating agents and co-solvents.
4. The method according to claim 1, wherein the HFA propellant is HFA 134a.
5. The method according to claim 1, wherein the HFA propellant is HFA p227.
6. The method according to claim 1, wherein the HFA adsorbent material is capable of adsorbing the HFA propellant up to about 25% of the weight of the adsorbent.
7. The method according to claim 1, wherein the HFA gas adsorbent material is capable of adsorbing the HFA propellant up to about 20% of the weight of the adsorbent.
8. The method according to claim 1, wherein the HFA adsorbent material comprises material selected from the group consisting of molecular sieves, activated clays, activated alumina, silica, zeolites, bauxites, and mixtures thereof.

9. The method according to claim 8, wherein the HFA adsorbent material is 10 Å (Angstrom) molecular sieves.
10. The method according to claim 9, wherein the molecular sieves, in an amount of about 4 grams, absorbs about 230 ml of HFA p227.
11. The method according to claim 9, wherein the molecular sieves, in an amount of about 4 grams, absorbs about 230 ml of HFA 134a.
12. The method according to claim 1, wherein the package is impermeable to HFA 134a.
13. The method according to claim 1, wherein the package is impermeable to HFA p227.
14. The method according to claim 1, wherein the package is permeable to HFA p227.
15. The method according to claim 14, wherein the package has a permeability to HFA p227 that is less than or equal to about 0.25 cc of HFA p227 per square meter of package per day at about 1 bar pressure and about room temperature.
16. The method according to claim 14, wherein the package has a permeability to HFA p227 that is less than or equal to about 0.15 cc of HFA p227 per square meter of package per day at about 1 bar pressure and about room temperature.
17. The method according to claim 14, wherein the package has a permeability to HFA p227 that is less than or equal to about 0.10 cc of HFA p227 per square meter of package per day at about 1 bar pressure and about room temperature.
18. The method according to claim 14, wherein the package has a permeability to HFA p227 that is less than or equal to about 0.05 cc of HFA p227 per square meter of package per day at about 1 bar pressure and about room temperature.
19. The method according to claim 1, wherein the package is permeable to HFA 134a.
20. The method according to claim 19, wherein the package has a permeability to HFA 134a that is less than or equal to about 4.1 cc of HFA 134a per square meter of package per day at about 1 bar pressure and about room temperature.
21. The method according to claim 19, wherein the package has a permeability to HFA 134a that is less than or equal to about 3.5 cc of HFA 134a per square meter of package per day at about 1 bar pressure and about room temperature.

22. The method according to claim 19, wherein the package has a permeability to HFA 134a that is less than or equal to about 2.5 cc of HFA 134a per square meter of package per day at about 1 bar pressure and about room temperature.

23. The method according to claim 19, wherein the package has a permeability to HFA 134a that is less than or equal to about 1.5 cc of HFA 134a per square meter of package per day at about 1 bar pressure and about room temperature.

24. The method according to claim 19, wherein the package has a permeability to HFA 134a that is less than or equal to about 1.0 cc of HFA 134a per square meter of package per day at about 1 bar pressure and about room temperature.

25. The method according to claim 19, wherein the package has a permeability to HFA 134a that is less than or equal to about 0.5 cc of HFA 134a per square meter of package per day at about 1 bar pressure and about room temperature.

26. The method according to claim 1, wherein the package is made of metal, glass, or plastic, and is selected from the group consisting of bottles, bags, drum boxes, and irregularly shaped containers.

27. The method according to claim 1, wherein the package is made of plastic.

28. The method according to claim 27, wherein the plastic is a flexible laminate having a barrier layer providing said package with permeability to HFA 134a and/or HFA p227.

29. The method according to claim 27, wherein the plastic is a flexible laminate having a barrier layer providing said package with impermeability to HFA 134a and/or HFA p227.

30. The method according to claim 29, wherein said flexible laminate has three layers: polyester / aluminum / polyethylene, wherein the aluminum layer is between the polyester and polyethylene layers.

31. The method according to claim 29, wherein said barrier layer is made of aluminum foil.

32. The method according to claim 1, wherein the sealed package is hermetically sealed by heat-sealing, gluing, welding, brazing, mechanical closures or clamps, or compression.

33. Use of an HFA adsorbent to maintain the pressure of an enclosed volume within a sealed package at about ambient pressure, wherein the sealed package comprises:

(i) a pressurized MDI (metered dose inhaler) container comprising a drug, a HFA (hydrofluoroalkane) propellant selected from the group consisting of HFA 134a and HFA p227, or a mixture thereof;

(ii) an effective amount of an HFA adsorbent material;

wherein the pressurized MDI container and HFA adsorbent material are within the enclosed volume of the sealed package.

34. The use according to claim 33, wherein the drug is selected from the group consisting of bronchodilators, antihistamines, lung surfactants, antiviral agents corticosteroids, ant-inflammatory agents, anti-cholinergics, and antibiotics.

35. The use according to claim 33, wherein the pressurized MDI (metered dose inhaler) container further comprises one or more excipients selected from the group consisting of surfactants, preservatives, flavorings, antioxidants, anti-aggregating agents and co-solvents.

36. The use according to claim 33, wherein the HFA propellant is HFA 134a.

37. The use according to claim 33, wherein the HFA propellant is HFA p227.

38. The use according to claim 33, wherein the HFA adsorbent material is capable of adsorbing the HFA propellant up to about 25% of the weight of the adsorbent.

39. The use according to claim 33, wherein the HFA gas adsorbent material is capable of adsorbing the HFA propellant up to about 20% of the weight of the adsorbent.

40. The use according to claim 33, wherein the HFA adsorbent material comprises material selected from the group consisting of molecular sieves, activated clays, activated alumina, silica, zeolites, bauxites, and mixtures thereof.

41. The use according to claim 40, wherein the HFA adsorbent material is 10 Å (Angstrom) molecular sieves.

42. The use according to claim 41, wherein the molecular sieves, in an amount of about 4 grams, absorbs about 230 ml of HFA p227.

43. The use according to claim 41, wherein the molecular sieves, in an amount of about 4 grams, absorbs about 230 ml of HFA 134a.

44. The use according toclaim 33, wherein the package is impermeable to HFA 134a.

45. The use according to claim 33, wherein the package is impermeable to HFA p227.

46. The use according to claim 33, wherein the package is permeable to HFA p227.

47. The use according to claim 46, wherein the package has a permeability to HFA p227 that is less than or equal to about 0.25 cc of HFA p227 per square meter of package per day at about 1 bar pressure and about room temperature.

48. The use according to claim 46, wherein the package has a permeability to HFA p227 that is less than or equal to about 0.15 cc of HFA p227 per square meter of package per day at about 1 bar pressure and about room temperature.

49. The use according to claim 46, wherein the package has a permeability to HFA p227 that is less than or equal to about 0.10 cc of HFA p227 per square meter of package per day at about 1 bar pressure and about room temperature.

50. The use according to claim 46, wherein the package has a permeability to HFA p227 that is less than or equal to about 0.05 cc of HFA p227 per square meter of package per day at about 1 bar pressure and about room temperature.

51. The use according to claim 33, wherein the package is permeable to HFA 134a.

52. The use according to claim 51, wherein the package has a permeability to HFA 134a that is less than or equal to about 4.1 cc of HFA 134a per square meter of package per day at about 1 bar pressure and about room temperature.

53. The use according to claim 51, wherein the package has a permeability to HFA 134a that is less than or equal to about 3.5 cc of HFA 134a per square meter of package per day at about 1 bar pressure and about room temperature.

54. The use according to claim 51, wherein the package has a permeability to HFA 134a that is less than or equal to about 2.5 cc of HFA 134a per square meter of package per day at about 1 bar pressure and about room temperature.

55. The use according to claim 51, wherein the package has a permeability to HFA 134a that is less than or equal to about 1.5 cc of HFA 134a per square meter of package per day at about 1 bar pressure and about room temperature.

56. The use according to claim 51, wherein the package has a permeability to HFA 134a that is less than or equal to about 1.0 cc of HFA 134a per square meter of package per day at about 1 bar pressure and about room temperature.

57. The use according to claim 51, wherein the package has a permeability to HFA 134a that is less than or equal to about 0.5 cc of HFA 134a per square meter of package per day at about 1 bar pressure and about room temperature.

58. The use according to claim 33, wherein the package is made of metal, glass, or plastic, and is selected from the group consisting of bottles, bags, drum boxes, and irregularly shaped containers.

59. The use according to claim 58, wherein the package is made of plastic.

60. The use according to claim 59, wherein the plastic is a flexible laminate having a barrier layer providing said package with impermeability to HFA 134a and/or HFA p227.

61. The use according to claim 59, wherein the plastic is a flexible laminate having a barrier layer providing said package with permeability to HFA 134a and/or HFA p227.

62. The use according to claim 60, wherein said flexible laminate has three layers: polyester / aluminum / polyethylene, wherein the aluminum layer is between the polyester and polyethylene layers.

63. The use according to claim 60, wherein said barrier layer is made of aluminum foil.

64. The use according to claim 33 wherein the sealed package is hermetically sealed by heat-sealing, gluing, welding, brazing, mechanical closures or clamps, or compression.

65. A pharmaceutical product comprising:

(i) a pressurized MDI (metered dose inhaler) container comprising a drug, and an HFA (hydrofluoroalkane) propellant selected from the group consisting of HFA 134a and HFA p227, or a mixture thereof;

(ii) an effective amount of an HFA adsorbent material; and

(iii) a sealed package having an enclosed volume within which the pressurized container and the HFA adsorbent material are situated,

wherein the sealed package is impermeable to the HFA propellant and the pressure within the enclosed volume of the package is equal to about ambient pressure; and

wherein the HFA adsorbent material is capable of adsorbing the HFA propellant so as to maintain a constant pressure within said enclosed volume, when any leakage of the HFA propellant occurs from the pressurized container.

66. The pharmaceutical product according to claim 65, wherein the drug is selected from the group consisting of bronchodilators, antihistamines, lung surfactants, antiviral agents, corticosteroids, ant-inflammatory agents, anti-cholinergics, and antibiotics.

67. The pharmaceutical product according to claim 65, wherein the pressurized MDI (metered dose inhaler) container further comprises one or more excipients selected from the group consisting of surfactants, preservatives, flavorings, antioxidants, anti-aggregating agents and co-solvents.

68. The pharmaceutical product according to claim 65, wherein the HFA propellant is HFA 134a.

69. The pharmaceutical product according to claim 65, wherein the HFA propellant is HFA p227.

70. The pharmaceutical product according to claim 65, wherein the HFA adsorbent material is capable of adsorbing the HFA propellant up to about 25% of the weight of the adsorbent.

71. The pharmaceutical product according to claim 65, wherein the HFA gas adsorbent material is capable of adsorbing the HFA propellant up about 20% of the weight of the adsorbent.

72. The pharmaceutical product according to claim 65, wherein the HFA adsorbent material comprises material selected from the group consisting of molecular sieves, activated clays, activated alumina, silica, zeolites, bauxites, and mixtures thereof.

73. The pharmaceutical product according to claim 72, wherein the HFA adsorbent material is 10 Å (Angstrom) molecular sieves.

74. The pharmaceutical product according to claim 73, wherein the molecular sieves, in an amount of about 4 grams, absorbs about 230 ml of HFA p227.

75. The pharmaceutical product according to claim 73, wherein the molecular sieves, in an amount of about 4 grams, absorbs about 230 ml of HFA 134a.

76. The pharmaceutical product according to claim 65, wherein the package is impermeable to HFA 134a.

77. The pharmaceutical product according to claim 65, wherein the package is impermeable to HFA p227.

78. The pharmaceutical product according to claim 65, wherein the package is made of metal, glass, or plastic, and is selected from the group consisting of bottles, bags, drum boxes, and irregularly shaped containers.

79. The pharmaceutical product according to claim 78, wherein the package is made of plastic.

80. The pharmaceutical product according to claim 79, wherein the plastic is a flexible laminate having a barrier layer providing said package with impermeability to HFA 134a and/or HFA p227.

81. The pharmaceutical product according to claim 80, wherein said flexible laminate has three layers: polyester / aluminum / polyethylene, wherein the aluminum layer is between the polyester and polyethylene layers.

82. The pharmaceutical product according to claim 80, wherein said barrier layer is made of aluminum foil.

83. The pharmaceutical product according to claim 65, wherein the sealed package is hermetically sealed by heat-sealing, gluing, welding, brazing, mechanical closures or clamps, or compression.

84. A pharmaceutical product comprising:

(i) a pressurized MDI (metered dose inhaler) container comprising a drug, and an HFA (hydrofluoroalkane) propellant selected from the group consisting of HFA 134a and HFA p227, or a mixture thereof;

(ii) an effective amount of an HFA adsorbent material; and

(iii) a sealed package having an enclosed volume within which the pressurized container and the HFA adsorbent material are situated,

wherein the pressure within the enclosed volume of the package is equal to about ambient pressure;

wherein the HFA adsorbent material is capable of adsorbing the HFA propellant so as to maintain a constant pressure within said enclosed volume, when any leakage of the HFA propellant occurs from the pressurized container; and

wherein the package has a permeability to HFA p227 that is less than or equal to about 0.25 cc of HFA p227 per square meter of package per day at about 1 bar pressure and about room temperature, or a permeability to HFA 134a that

is less than or equal to about 4.1 cc of HFA 134a per square meter of package per day at about 1 bar pressure and about room temperature.

85. A pharmaceutical product according to claim 84, wherein the package has a permeability to HFA p227 that is less than or equal to about 0.15 cc of HFA p227 per square meter of package per day at about 1 bar pressure and about room temperature.

86. A pharmaceutical product according to claim 84, wherein the package has a permeability to HFA p227 that is less than or equal to about 0.10 cc of HFA p227 per square meter of package per day at about 1 bar pressure and about room temperature.

87. A pharmaceutical product according to claim 84, wherein the package has a permeability to HFA p227 that is less than or equal to about 0.05 cc of HFA p227 per square meter of package per day at about 1 bar pressure and about room temperature.

88. A pharmaceutical product according to claim 84, wherein the package has a permeability to HFA 134a that is less than or equal to about 3.5 cc of HFA 134a per square meter of package per day at about 1 bar pressure and about room temperature.

89. A pharmaceutical product according to claim 84, wherein the package has a permeability to HFA 134a that is less than or equal to about 2.5 cc of HFA 134a per square meter of package per day at about 1 bar pressure and about room temperature.

90. A pharmaceutical product according to claim 84, wherein the package has a permeability to HFA 134a that is less than or equal to about 1.5 cc of HFA 134a per square meter of package per day at about 1 bar pressure and about room temperature.

91. A pharmaceutical product according to claim 84, wherein the package has a permeability to HFA 134a that is less than or equal to about 1.0 cc of HFA 134a per square meter of package per day at about 1 bar pressure and about room temperature.

92. A pharmaceutical product according to claim 84, wherein the package has a permeability to HFA 134a that is less than or equal to about 0.5 cc of HFA 134a

per square meter of package per day at about 1 bar pressure and about room temperature.

93. A pharmaceutical product according to claim 84, wherein the drug is selected from the group consisting of bronchodilators, antihistamines, lung surfactants, antiviral agents, corticosteroids, ant-inflammatory agents, anti-cholinergics, and antibiotics.

94. A pharmaceutical product according to claim 84, wherein the pressurized MDI (metered dose inhaler) container further comprises one or more excipients selected from the group consisting of surfactants, preservatives, flavorings, antioxidants, anti-aggregating agents and co-solvents.

95. A pharmaceutical product according to claim 84, wherein the HFA propellant is HFA 134a.

96. A pharmaceutical product according to claim 84, wherein the HFA propellant is HFA p227.

97. A pharmaceutical product according to claim 84, wherein the HFA adsorbent material is capable of adsorbing the HFA propellant up to about 25% of the weight of the adsorbent.

98. A pharmaceutical product according to claim 84, wherein the HFA gas adsorbent material is capable of adsorbing the HFA propellant up to about 20% of the weight of the adsorbent.

99. A pharmaceutical product according to claim 84, wherein the HFA adsorbent material comprises material selected from the group consisting of molecular sieves, activated clays, activated alumina, silica, zeolites, bauxites, and mixtures thereof.

100. A pharmaceutical product according to claim 99, wherein the HFA adsorbent material is 10 Å (Angstrom) molecular sieves.

101. A pharmaceutical product according to claim 100, wherein the molecular sieves, in an amount of about 4 grams, absorbs about 230 ml of HFA p227.

102. A pharmaceutical product according to claim 100, wherein the molecular sieves, in an amount of about 4 grams, absorbs about 230 ml of HFA 134a.

103. A pharmaceutical product according to claim 84, wherein the package is made of metal, glass, or plastic, and is selected from the group consisting of bottles, bags, drum boxes, and irregularly shaped containers.

104. A pharmaceutical product according to claim 103, wherein the package is made of plastic.

105. A pharmaceutical product according to claim 104, wherein the plastic is a flexible laminate having a barrier layer providing said package with permeability to HFA 134a and/or HFA p227.

106. A pharmaceutical product according to claim 105, wherein said flexible laminate has three layers: polyester / aluminum / polyethylene, wherein the aluminum layer is between the polyester and polyethylene layers.

107. A pharmaceutical product according to claim 105, wherein said barrier layer is made of aluminum foil.

108. A pharmaceutical product according to claim 84, wherein the sealed package is hermetically sealed by heat-sealing, gluing, welding, brazing, mechanical closures or clamps, or compression.